SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE AMERICAN SOCIETY OF NATURALISTS.

*HOMO SCIENTIFICUS AMERICANUS.**

MEMBERS of a society of naturalists, which includes psychology and anthropology in its scope, are familiar with the part played by rites and ceremonies in social evolution. Millions of holy shrines have been red with the blood of victims, and from countless altars the smell of burnt offerings has risen to heaven, in order that men should be united in closer bonds. We have not broken with the past; we meet together at our annual feast; the lot has fallen on your human sacrifice. Your social service is witnessed by the fact that you do not send him a scape-goat into the wilderness, but come to share his suffering.

The objects of our society, as I understand them, are not the increase of facts and the discussion of theories in each of the natural sciences. Our aim is rather to be

* Address of the president of the American Society of Naturalists, read at the annual dinner, Washington, D. C., January 1, 1903.

a center of organization which shall concern itself with the conditions that are essential to the advancement of science. Our annual discussions and addresses have as a rule treated questions of this character. We ourselves are such a problem. Men of science are the central factor on which scientific progress depends. This is indeed so obvious that we are apt to take ourselves for granted, directing our attention to external conditions that are in fact of far less importance. The remote and the abnormal first attract the curiosity. Psychology is the newest of the sciences and astronomy the oldest, though we really know more about ourselves than we ever shall know about the stars. We are indeed so familiar with the rich complexity of our perceptions, thoughts, feelings and actions that it is difficult to make those artificial abstractions which we call a science. The stars are so far away, atoms are so invisible, we know after all so little about them, that astronomy and chemistry may become exact sciences without contradiction. But if there were as many chemical elements as there are people, the discovery of a new element would be no more important for science than the birth of a new baby in the negro quarter of Washington; if the stellar systems were all visible, the discovery of a new satellite would be of no more interest to the world than the mother's sight of her baby's last tooth. The play of a child for a single day is more complex than the known performance of the stellar universe, and each child changes every day and is different from every other child.

But when the psychologist finds that biology has had the patience to define a million species he may take courage. The differences between individuals or between classes of individuals may be as valid for psychology as are species and varieties for zoology and botany. If it is said that the differences in men of the same race are too obscure and shifting to admit of classification, it may be replied that this can not be settled before an inductive study has been made. If it is said that human differences depend chiefly on the environment of the individual, it may be replied that it is a scientific problem to determine what depends on heredity and what on environment, and that the investigation of the effects of environment may be not less interesting scientifically and more important practically than the study of traits that are beyond control. I for my part do not hesitate to claim that the differences between Shakespere and Darwin are as great as those between *Aspasma minima* (Döderlein) and *Aspasma Ciconiæ* (Jordan and Fowler),* and that it is as nearly in our power to develop an *Aspasma Ciconiæ* (Jordan and Fowler) from the egg of an *Aspasma minima* (Döderlein), as to turn the baby next at hand into a Darwin.

Science is inclined to be somewhat conventional in the subjects it considers, holding fast to an orthodoxy of its own. Once it was a burning question as to how many angels could dance on the point of a needle; now we become equally warm on the subject of the number of species in a given genus. There is no obvious reason why we can not consider with equal propriety how many different kinds of scientific men there are. A tentative classification must precede a study of distribution and life-areas, and when this has been accomplished we shall be in a position to take up the natural history or ecology of men of science.

Following the preliminary work of de Candolle and Dr. Galton, I have for some time been engaged in an investigation of

* "This species is distinguished from *Asparma* [sic] *minima* by the ends of the dorsal and anal reaching the caudal and thus their bases are upon the caudal peduncle; it also differs in the larger number of fin rays." Jordan and Fowler, *Proceedings of the National Museum*, XXV., p. 415, 1902.

the scientific men of the United States. I am selecting a thousand of them for subjects, and have at the same time chosen for similar study the thousand most eminent men in history and a thousand students of Columbia College. Each of these three groups seems to me favorable for such work. The students of Columbia College are measured, tested and observed in my laboratory; we are able to follow their academic courses and their careers in after life. The lives of the most eminent men of history are to a certain extent public property, open to statistical investigation and psychological analysis. A thousand scientific men in the United States would doubtless be willing to assist in furnishing the material needed, which is in any case accessible from other sources. It was at one time my intention to base this address on an inductive study of these scientific men. My reasons for not doing so are similar to those of a friend who was asked why he did not bring his wife to this dinner. He replied that he did not suppose that women were welcome, and besides he was not married. I fear that statistics would be rather out of place and unpresentable on such an occasion, and besides I have not the statistics. I am, however, trying to get them, and not being able to find a more satisfactory subject for my remarks, I must ask your permission to say something in regard to ways and means and such preliminary results as are at hand.

I have been aided in collecting data for my work by the preparation of a biographical catalogue of the living scientific men of the United States, for which the Carnegie Institution has defrayed part of the clerical expense. This additional task has, however, delayed the completion of my work, owing to the increased mass of material that has accumulated. There were on my preliminary list more than 8,000 names, and after those who have not done research work in the natural and exact sciences have been eliminated, there still remain some 4,000 scientific men in place of the one thousand with whom I had intended to deal. It was to me surprising, as well as gratifying, to find that our men of science are so numerous. Brown Goode estimated in 1886 that the number of scientific men in the United States numbered about 500, and Dr. Galton estimated in 1874 that those in the British Islands 'would amount to 300, but not to more.' If these estimates were correct, there has been a noteworthy increase in the number of scientific men, and it appears that the Gauss-Quetellet curve of distribution does not hold for scientific eminence, as we certainly have not ten times as many eminent scientific men as there were in Great Britain twenty-nine years ago. Perhaps we are on the average as competent, and only less eminent because there are so many of us among whom this quality must be divided.

As I have already indicated, our first step in the study of scientific men must be to classify them. Logical classifications of the sciences have been attempted, but with only tolerable success, at least beyond a threefold division into the physical, biological and mental sciences. These divisions are fairly valid—the physical sciences being primarily quantitative and independent of the others; the biological sciences being primarily genetic, but dependent on the physical sciences; and the mental sciences being largely analytic and speculative, but, when properly developed, being both quantitative and genetic, and depending on the physical and biological sciences. Even this broad division, however, must break down —the physical sciences must become genetic and the biological sciences must become quantitative; and the divisions are

interdependent, a science, such as physiology, for example, obliterating the distinctions.

On the whole we may expect to secure the best classification as the result of an inductive study of scientific men. Classifications have, as a matter of fact, resulted from natural selection in the development of scientific courses of instruction, books, journals, bibliographies, societies and the like. I have made compilations of this character, which enter too much into detail to present here. I have also let the scientific men of the United States classify themselves. As a result of this inductive study, but doubtless also under the influence of logical considerations, I have made the classification of the sciences shown on the chart which I have distributed.

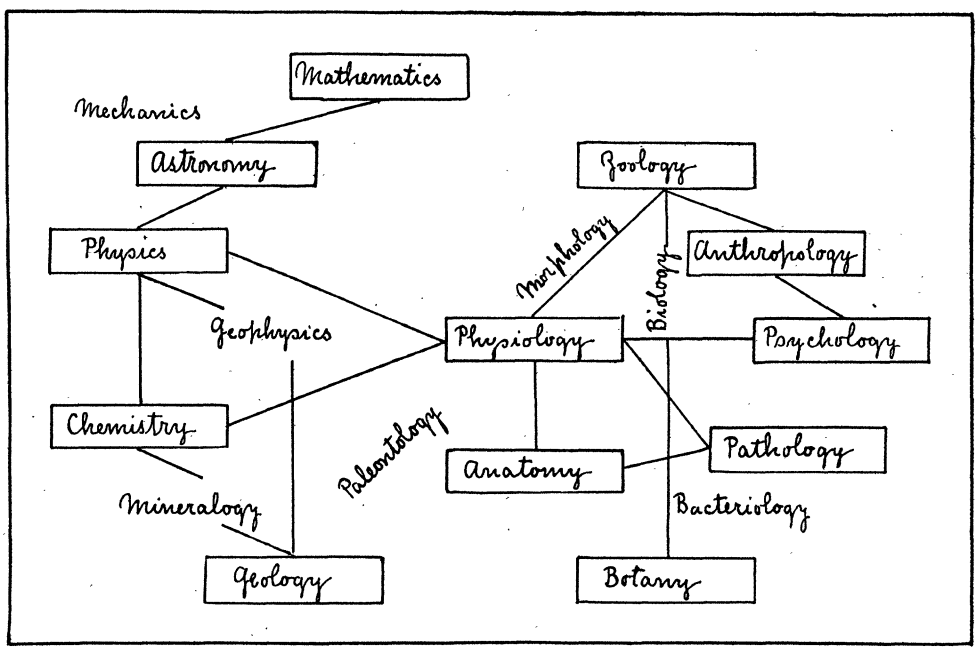

CHART SHOWING THE RELATIONS OF THE SCIENCES.

The graphical representation of the relations of the sciences on a plane turned out to be more feasible than I had anticipated. It must not, however, be understood as intended to assign separate plots to the sciences, but rather to show their complex interdependence and to indicate some of the classifications that can be made. Mathematics, both in its methods and in its relations to the other sciences, occupies a unique position, which can be indicated by placing it above the sciences and nearest to those that are the most exact. Physics, chemistry and psychology are the fundamental sciences on which all the others depend. Physics-chemistry at one side of the chart and psychology at the other indicate this graphically. The facts of matter in motion or energy and the facts of consciousness are more clearly distinct than any other phenomena, while at the same time, being abstractions from the same experience, they are absolutely interdependent. Physical science presupposes perceptions and reasoning, while minds are conditioned by the physical world. Physiology, whether or not life be regarded

as a manifestation of a special form of energy, occupies a central position, forming one triangle with physics and chemistry, and another with zoology and botany. It also forms properly a triangle with the secondary sciences, astronomy and geophysics, and parallels psychology. The great natural sciences, geology, zoology and botany, form a triangle, and their interrelations with the other sciences are indicated with tolerable accuracy by their places on the chart. Anthropology, anatomy and pathology might be included logically under zoology or botany, but owing to their actual development they deserve distinct places. Several other sciences in their interrelationships are indicated on the chart. There might also be entered further to the right sciences such as philology, sociology, history, etc., dependent primarily on psychology, but also on the material sciences. On a plane above that of the chart might be put the applied sciences—engineering, agriculture, medicine, education, etc., each of which rests on a large number of pure sciences, but has specially close connections with one or more of them.

Limiting the scope of this inquiry to the twelve sciences indicated, the men of science of the United States are distributed by various agencies, as shown approximately on the table. On the lower half of the table the same figures are reduced to the common standard of a thousand in each class. Chemists, zoologists and physicists are the most numerous, each group containing about one seventh of our scientific men. About one man of science in ten is a geologist, a botanist and a mathematician; about one in twenty a pathologist and an astronomer. In decreasing numbers then come the physiologists, the psychologists, the anatomists and the anthropologists. It should be noted that the Chemical Society is large, and degrees in chemistry are numerous because chemistry is an applied as well as a pure science. Teachers of mathematics and of the medical sciences are numerous because these are required subjects of study; original contributions are scanty as compared with the numbers of those who teach them.

TABLE I.

THE NUMBER OF AMERICAN MEN OF SCIENCE AND THEIR DISTRIBUTION AMONG THE SCIENCES.

	Special Societies.	Fellows of Association.	Members of Academy.	University Professors.	Doctorates in Five Years.	Contributors to SCIENCE 13 Vols.	Who's Who.	Biographical Dictionary (estimated).
Mathematics.	375	81	1	136	61	35	46	380
Physics.....	149	167	23	105	69	155	73	556
Chemistry....	1933	174	12	143	137	73	166	656
Astronomy...	125	40	12	41	16	48	51	212
Geology.....	256	121	13	55	32	161	174	436
Botany.....	169	120	7	57	53	94	70	416
Zoology.....	237	146	17	83	72	243	131	620
Physiology...	96	10	2	53	18	22	25	156
Anatomy.....	136	10	0	56	1	13	18	116
Pathology...	138	14	5	68	4	44	56	224
Anthropology.	60	60	3	4	5	56	37	92
Psychology...	127	40	1	37	63	58	21	136
	3801	983	96	838	531	1002	868	4000

REDUCED TO PER THOUSAND.

Mathematics.	99	32	10	162	113	35	53	95
Physics.....	39	170	240	125	128	155	84	139
Chemistry....	506	177	125	171	265	73	191	164
Astronomy...	33	41	125	49	30	47	59	53
Geology.....	68	123	136	66	60	161	200	109
Botany.....	45	122	73	68	99	94	81	104
Zoology.....	63	149	177	99	134	243	151	155
Physiology...	25	10	21	63	34	22	29	39
Anatomy.....	36	10	0	67	2	13	21	29
Pathology....	36	14	52	81	8	44	64	56
Anthropology.	16	61	31	5	9	56	43	23
Psychology...	34	41	10	44	118	57	24	34

The statistics that I am collecting will give more valid data in regard to the number and distribution of the men of science of the United States than any of the other classes. Next in importance, representing as they do the future rather than the past or present, are the degrees of doctor of philosophy conferred. It has taken during the past five years, in round

numbers, fifty professors of anatomy and sixteen professors of pathology to produce one new investigator; it has taken more than two professors of mathematics or of astronomy to produce an investigator. Each professor of chemistry, zoology and botany has produced one investigator. Psychology has the best record, each professor having produced two investigators. I may be pardoned for referring with gratification to the promise of my own science. The membership of the National Academy of Sciences seems to be the most erratic of the data. Approximately one in twenty of the astronomers and physicists of the country are members of the academy, one in sixty of the botanists, one in a hundred of the psychologists, and one in four hundred of the mathematicians. It is obvious that the Gauss-Quetellet curve entirely fails in its application to the distribution of scientific ability, that eminence may be obtained with much less ability in some sciences than in others, or that some sciences have been favored in elections to the academy.

I am at present engaged, as I have already stated, in a statistical study of these scientific men. I am putting on cards certain data which it will be worth while to summarize. Thus the distribution of men engaged in the several sciences in different parts of the country and its relation to the total population, the relative numbers in large centers, connected with institutions of learning, etc., the comparison of the present location with the place of birth, the education, the ages, the amount of shifting from one institution to another, the rate of promotion, the character and quantity of research, etc., of these scientific men will have a certain interest. This interest will be enhanced and become more truly scientific in character if similar statistics are collected for other countries and for this country at periods of ten years.

This must be left to the future. I am, however, proceeding with work which I trust has a certain scientific and psychological value. I am selecting from all those who have carried on scientific research the thousand whose work is regarded as most valuable. The numbers chosen from each science are in proportion to the total workers in that science. I am asking representatives of each science—selecting those who are most eminent and who are at the same time believed to be familiar with the conditions—to arrange the students in that science in the order of merit. It is obvious that this can only be done approximately. There are diverse lines of research in each science which it is difficult to compare, and there are various ways of contributing to a science which are scarcely commensurable. It strikes some that we are in the condition of the boy at his geometry lesson who when asked what follows when two sides of a triangle are equal replied that all the other sides would be equal too; or of the man who when asked if he did not think the story of the *raconteur* in his anecdote a little broad said he did not think it was as broad as it was long. It is, however, the business of science to overcome insurmountable difficulties; and it is one of the triumphs of science that it can in certain cases measure our ignorance as well as our knowledge.

If the workers in a science are arranged in the order of merit independently by a number of observers, the average position of each can be found and its probable error calculated. Thus we can say that to the best of our knowledge a man stands eighth among our mathematicians and that the chances are even that his real position is between sixth and tenth. The same man might stand eightieth among our scientific men with a probable error of twenty places. The probable errors show that the order of arrangement has validity within

certain limits and tells us what this validity is. The sizes of the probable errors increase rapidly as we go down the list, thus proving some degree of approximation to the theoretical curve, based on the assumption that scientific merit and eminence are dependent on a large number of small causes and giving us the data for the construction of the actual curve.

I am certainly under great obligations to those who assist me in making the arrangements; some find it interesting, others irksome; all show a certain amount of reliance on my discretion. The individual lists will of course be used only for the averages and probable errors, and no record is kept of those who make them. I could doubtless give this address a *succès de scandale* by reading to you the order of merit so far as ascertained, but I have no intention of making public the list until such time has elapsed that each may assume that if the process were repeated he would stand at the head. But while the list may not be published, it is possible to draw from it certain deductions of scientific and practical value. The statistics of the whole number of scientific men have greater interest when compared with those of the more eminent thousand. We can tell whether the average scientific standard in one part of the country, at a given university, etc., is higher or lower than elsewhere; we can give quantitatively, the men being weighted, the scientific strength of a university or department. It would be possible to determine more exactly than by existing methods who should be a fellow of the American Association or a member of the National Academy. It is possible to correlate age, education and other factors with scientific eminence.

The selection of the thousand scientific men who are thought to have done the best work, and their arrangement in the order of merit, are somewhat incidental to my main object, which is to secure a group sufficiently large and homogeneous for scientific study and for comparison with other groups. The problems that are opened and may ultimately be solved are numerous and not unimportant. The old question of the relative contribution of heredity and environment to the making of the individual must for men be solved by a study of men. The infant is more plastic and his surroundings are more varied than is the case with other animals. We may find that the mathematician must be born, whereas the naturalist can be made by a sea voyage. The little scientist can doubtless be made, but probably the great man of science must be born. We have to determine what conditions of both nature and nurture are favorable for the production of usefulness and greatness in scientific work. We should like to know at what age the future of a man can be foretold with a given degree of probability, at what age he has his most original ideas, at what age he does his most efficient work, at what age he is likely to become a public nuisance. We want to know what conditions of health, habits, family, employment, rewards and the like are favorable for scientific performance. In general, we should like to find out how we scientific people differ among ourselves and from others, to make a natural history of scientific men and to use the knowledge for the improvement of the breed.

I have made a small beginning in the direction of getting a scientific description of men of science. At the present convocation of scientific societies I have arranged an anthropometric laboratory in which certain physical, psychophysical and mental tests are being made. These will show how in some fundamental traits scientific men differ among themselves and from other groups.

Certain other traits I am attempting to

estimate and grade. These are shown on the second table. The terms are partly self-explanatory. We know what is meant by physical health and mental sanity and balance. The three next categories follow the analysis of consciousness current in psychology. We distinguish three aspects of mental life—the cognitive, the emotional and the volitional. One of these may be particularly well developed. The man of science must perceive correctly and reason clearly; the artist must have vivid emotions; the statesman or soldier must have a strong will and be prompt to act. These traits are not exclusive of one another, as is usually assumed. The eminent man of science is far more likely than the average man to be a poet or an efficient executive officer. This may be because the traits are correlated, or it may be because the man of achievement must excel in various traits which have been accidentally united in him. This is a question of considerable scientific and practical importance, but one too new and technical for discussion here. I may, however, state that in the Columbia tests we have found a lack of correlation; for example, the man who has a good memory is not more likely than another to be accurate or quick in perception.

The next group of qualities is adopted from my own work in psychology. I have tried to prove by experiment that mental processes vary in time, in intensity and in extensity, that these magnitudes can be measured, and that they are correlated with the time, energy and space relations of the physical world. These fundamental quantitative categories appear to be applicable to character as a whole—a man may be quick or slow, strong or weak, broad or narrow. These qualities seem to me to define and render more exact the four temperaments which are almost the only types of character that have obtained currency. Thus the choleric man is quick and

TABLE II.

GRADES FOR DIFFERENT TRAITS ASSIGNED TO FIVE MEN OF SCIENCE.

	A.	*P. E.*	B.	*P. E.*	C.	*P. E.*	D.	*P. E.*	E.	*P. E.*	Av.	Av.
Physical health	63	*6*	55	*4*	26	*6*	90	*3*	12	*4*	49.2	4.6
Mental balance	84	*3*	79	*3*	32	*6*	45	*6*	20	*4*	52	4.4
Intellect	90	*3*	57	*4*	79	*3*	38	*6*	49	*3*	62.6	3.8
Emotions	13	*5*	26	*4*	24	*5*	26	*4*	55	*6*	28.8	4.8
Will	90	*4*	45	*3*	49	*4*	63	*3*	2	*3*	49.8	3.4
Quickness	87	*3*	57	*3*	99	*1*	9	*6*	33	*5*	57	3.6
Intensity	82	*2*	25	*4*	76	*3*	57	*5*	8	*3*	49	3.4
Breadth	93	*3*	74	*4*	38	*6*	63	*3*	68	*4*	67.2	4
Energy	98	*1*	32	*4*	90	*3*	77	*3*	3	*4*	60	3
Judgment	96	*2*	70	*4*	30	*3*	30	*5*	15	*6*	48.2	4
Originality	82	*3*	17	*3*	84	*4*	66	*4*	8	*5*	51.4	3.8
Perseverance	96	*2*	30	*4*	54	*5*	87	*3*	1	*1*	53.6	3
Reasonableness	67	*5*	93	*2*	20	*4*	38	*6*	20	*6*	47.6	4.6
Clearness	90	*3*	74	*4*	72	*4*	17	*4*	45	*6*	59.6	4.2
Independence	94	*4*	57	*3*	72	*4*	52	*5*	5	*5*	56	4.2
Cooperativeness	63	*4*	49	*4*	19	*4*	38	*7*	10	*6*	35.8	5
Unselfishness	38	*4*	67	*3*	10	*4*	45	*6*	17	*6*	35.4	4.6
Kindliness	45	*7*	82	*2*	10	*4*	54	*6*	48	*5*	47.8	4 8
Cheerfulness	48	*5*	77	*4*	34	*5*	34	*7*	26	*5*	43.8	5.2
Refinement	52	*4*	72	*4*	8	*3*	4	*3*	63	*4*	39.8	3.6
Integrity	96	*2*	87	*2*	38	*6*	76	*4*	38	*7*	67	4.2
Courage	95	*3*	52	*3*	51	*5*	45	*5*	12	*4*	51	4
Efficiency	100	*1*	57	*3*	74	*3*	34	*4*	4	*4*	53.8	3
Leadership	87	*2*	20	*3*	17	*4*	6	*4*	6	*5*	27.2	3.6
	77	*3.3*	56.4	*3.3*	46	*4.1*	45.5	*4.6*	23.6	*4.6*	49.7	4

strong, the phlegmatic man is slow and strong, the sanguine man is quick and weak, the melancholic or sentimental man is slow and weak. But any one of these types may be broad or narrow, and this seems to be as characteristic a distinction as quickness or intensity. Further, these characteristics may vary in different degrees; the men called phlegmatic are slow, but not to the same extent; they vary more in strength and still more in breadth.

The descriptive terms that follow have been selected from a large collection that I have made and are intended to cover the ground as completely as may be with a limited number. The whole plan is as yet tentative and is doubtless open to improvement toward which I shall welcome any suggestions.

It is my intention to grade and to ask others to grade scientific men for these various qualities. It is not necessary to enter here into details of method. I submit, however, on the table the grades that have been given to five of those entitled to be present at this dinner. The grades were assigned independently by twelve observers acquainted with the men, and have been adjusted and distributed on the supposition that the group of individuals and the distribution of the traits represented average values. The grades are arranged on a scale of one hundred and probable errors are attached. The probable errors, though assigned by the usual formula, are, I think, too small; but they are correct relatively and show which traits are judged with greatest unanimity. We have seen that there are about 4,000 scientific men in the United States. A grade of 100 for efficiency means that the man is thought to stand among the forty most efficient scientific men of the country. A grade of 26 for integrity does not mean that a man is not honest, but that this trait is less marked in him than in three fourths of scientific men.

It may seem unkind, even inhuman, to grade men as though they were prize cattle at a county fair. It is sometimes said that modern science has banished mystery, romance and beauty from the world. But this is not true. The physician smokes too much, the obstetrician falls in love, and even the psychologist makes a fool of himself much as any other man. The rainbow is not less beautiful because Iris has been pierced by the refracted rays from the sun, nor is the universe less grand because Phœbus and his horses have fallen before the law of gravitation and the concept of order. We can not now design cathedrals, but we can build steamships and bridges that are beautiful.

It is our business to make both a science and an art of human nature. As in the physical world we select first the material suited to our purpose, then turn the iron into steel and temper the steel for the knife, so in the world of human action we must learn to select the right man, to educate him and to fit him for his exact task. This indeed we try to do in all our social institutions, religions, commerce, systems of education and government. But we work by the rule of thumb—blind, deaf and wasteful. The nineteenth century witnessed an extraordinary increase in our knowledge of the material world and in our power to make it subservient to our ends; the twentieth century will probably witness a corresponding increase in our knowledge of human nature and in our power to use it for our welfare.

Lest, in spite of sporadic efforts to the contrary, this address makes the impression of a scientific paper rather than of an after dinner speech, I shall conclude with certain speculations which may or may not be upheld by an inductive study. It seems to me that scientific men suffer in character

because they are employees rather than free men. We are not permitted to follow our chosen leaders, but men are placed in authority over us. We are paid to teach or the like; our scientific work must be done almost clandestinely. We do not earn our livings and support our families by the results of our real work; we are grateful if some charity will publish them for us. The pleasure of discovery, fame and honor are supposed to be our reward. Every normal man finds his chief pleasure in doing his work well and with the appreciation of others; but under existing social institutions the value of his work and the approval of his fellows are usually measured by his freedom and his income. The scientific man, seeking the truth without regard to consequence, should be more fearless, simple, fair and kindly than others. In so far as this is not the case, it appears to me to be due to the conditions under which he works.

Evolution has progressed by the survival of the strong and the cunning, of those armed with tooth and claw, of those quick to run and ready to hide. It has given us the vulture and the parasite. Human history has left us the legacy of the iron hand and the crooked back. The man engaged in scientific work has too often filled the position of an upper servant—a tutor to the sons of the rich, a priest subscribing to tenets that are outworn, an employee dependent on the favor of presidents and boards,—for whom silence is silver and flattery gold. As the downtrodden have submitted to servitude on the ground that they will have their reward in a future life, so scientific men have labored in the hope of recognition and posthumous fame. They have scrambled for degrees, titles, membership in academies and the like, trying to climb up on each others' necks. But the things that have been are not the things that shall be. The men who labor with their hands have learned to unite in trades-unions; they have shown themselves ready and able to make the utmost sacrifices for their common cause. And they have won; they have used the governors of states and the president of the United States for their purposes. Their leader can speak to the president on terms of equality; the members of the National Academy of Sciences waited last spring for an hour in the anteroom of the White House until he did them the honor to shake hands with them. Is there a university in the world whose faculty would resign because one member was unjustly treated, or would scientific men subscribe ten per cent. of their incomes to support a faculty that had so resigned? But the things that have been are not the things that shall always be.

Scientific men will not forever submit to being embroidered with gold braid and bound with red tape. The diplomacy and intrigues of courts are slowly giving way to the rough and ready ways of democracy. For a time there may be confusion and some waste; but on the whole there is more promise in the man in shirt sleeves than in the conventional gentleman. I believe that it is our part here in America to form a true democracy of science, where each will do the work for which he is best fit and will receive the reward that he deserves, where we shall choose our own leaders and follow our leaders because we recognize them as such. I am myself an optimist. I am sure that the time will come when scientific work will assume the position that belongs to it. The time will come when there will be peace and good will on earth, and all things will be managed efficiently and in accord with the pure light of reason. I am indeed so much of an optimist that I am glad to live in a period of transition and turmoil, rather than in the millennium for which we strive and suffer.

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